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THE USE OF PRESERVATIVES IN FOODS.[1]

By H. W. Wiley.

The question which has been long under discussion concerning the use of chemical preservatives in foods seems now to be approaching a final answer. The points which have been most discussed are, first, the necessity for the use of chemical preservatives, and, second, their effect upon health and digestion. The first of these problems relates largely to technical questions and to commercial operations and is one which is very properly discussed by both manufacturer and consumer. The second is a question of wholesomeness or harmfulness and cannot be properly discussed either by manufacturer or consumer unless such manufacturer or consumer is also a physiological chemist, a physician, or hygienist.

It is with pleasure that I have accepted your invitation to-day to open the discussion on this important subject which has of late been much in the public mind. I wish to state so far as possible the positions occupied by those who have favored the use of chemical preservatives in foods and also those who have discouraged the use thereof.

First of all, let us have a clear understanding of the class of bodies to which this discussion applies, namely, chemical preservatives. I mean by a chemical preservative one which is practically devoid of any condimental value, and which in the quantities used in foods imparts no distinctive odor or taste thereto and which possesses germicidal properties sufficient to destroy or paralyze bacteriological action and thus prevent that class of fermentations which lead

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to decay. I do not refer in any respect to condimental substances which incidentally may possess to a limited extent germicidal properties. During the last month this whole matter of the use of chemical preservatives has been presented to the Committee on Interstate and Foreign Commerce of the House of Representatives and the hearings have been printed as an official document entitled, "Hearings before the Committee on Interstate and Foreign Commerce of the House of Representatives on the Pure Food Bills H. R. 3040, 4527, 7018, 12071, 13086, 13853, and 13859."

The multitude of bills regulating interstate commerce in adulterated and misbranded foods and drugs which was under consideration is illustrated by the above list. A large number of representatives of interests affected by the bill appeared before the Committee for the purpose of securing in the legislation the legalization of the use of preservatives and coloring matters in food products. A number of experts also appeared before the Committee employed by the interested parties above mentioned for the purpose of furthering their interests. Four experts gave evidence in the matter, namely, Prof. Edward Kremers, of the University of Wisconsin; Prof. Frank Kedzie, of the Agricultural College of Michigan; Prof. Victor C. Vaughan, of the University of Michigan, and Dr. R. G. Eccles, of Brooklyn. All who are interested in the latest phases of the question under discussion should read this evidence, which doubtless could be obtained by addressing any of your senators or representatives in Congress.

I will summarize first the arguments of the manufacturers of foods and antiseptics. The gist of their arguments was that it is impossible to preserve certain kinds of foods without the use of antiseptics. When pressed for an answer as to the kinds of foods, it was developed that the classes referred to were chiefly substances like catsup, sweet pickles and fruit syrups for soda fountains. Practically all of the arguments advanced were confined to those classes of bodies. It was admitted by all that ordinary canned foods, whether fruits, vegetables or meats, could be well preserved without the use of antiseptics, and that in so far as cured meats were concerned, antiseptics were convenient but not indispensable. It also appeared in the evidence that even such a substance as catsup or fruit syrup could be well preserved by sterilization until it was opened for use, and that the chief use of the antiseptic was to pre-

serve the contents of the bottle after opening until they were entirely consumed.

The experts were not agreed among themselves as to the proper quantities of antiseptics to be admitted nor as to the kind of antiseptics which should be used. In general, they were opposed to the use of salicylic acid, sulphurous acid and formaldehyde, and favored the use of boric acid and benzoic acid. No satisfactory reasons were forthcoming for discriminating between these acids, save that the manufacturers themselves had generally abandoned the use of all the other preservatives except these two.

The expert testimony brought out the well-known fact that benzoic acid, especially, was contained in many food products and was therefore to be considered as a normal food constituent. With the exception of the cranberry, it appeared that no ordinary food contained anything more than a mere trace of benzoic acid. One of the principal arguments in favor of the wholesomeness of benzoic acid was based upon the fact that it occurred naturally in the cranberry. When it was represented to the Committee that the same logical conclusion would apply to the use of alum, arsenic, copper and hydrocyanic acid in foods, the untenability of the position maintained by these experts was at once brought out. One of the experts, Dr. Eccles, maintained that the exclusion of preservatives from foods was the cause of the high death-rate in Berlin and South Dakota. The data which he presented in support of this contention did not appear to be of a very conclusive character, and, as regards North Dakota, these data were shown to be wholly erroneous by Professor Ladd, the State Dairy and Food Commissioner of that State, not in a paper presented to the Committee but in an answer to the same argument of Dr. Eccles previously published. The most powerful support of the argument in favor of the use of antiseptics was given in the testimony of Dr. Vaughan. Dr. Vaughan stated in his testimony (page 65) the following:—

"I am sure that benzoic acid in the quantities in which it is used in tomato catsup, sweet pickles, etc., one part to 1200 or 2000, does not do any harm. I should be opposed to the use of formaldehyde in milk in any quantity or the use of any other preservatives in milk. I have testified repeatedly against the use of sulphite of soda on hamburger steaks."

Again on page 66, referring to our own experiments in Washington, he says:—

"But they have not shown that boric acid in the small quantities which should be used as a preservative, if used at all, has any effect on the animal body."

Mr. Adamson.—What do you mean by small quantities?

Mr. Vaughan.—I mean one-half of one per cent.

When asked by Mr. Mann how much benzoic acid you can eat Mr. Vaughan stated (page *72*):—

"I would have to answer only in a general way, and say a grain or two, I am sure, taken day by day for one's life, would not do one any harm."

Mr. Mann.—Do you mean one grain or two grains?

Mr. Vaughan.—One grain.

Mr. Mann.—Would two grains do any harm?

Mr. Vaughan.—Well, I do not know. I should say one grain would be perfectly safe. I do not know whether two grains would be or not.

It seems that the real reason or reasons which should have been advanced before the Committee were masked somewhat by the contentions outlined above. There is no doubt of the fact that it is far cheaper and more convenient to produce certain food products with the aid of chemical preservatives than it is to preserve them in any other way, and the actual reason which is behind all this contention of the manufacturers and experts is the production of a cheaper quality of goods. There can be no objection to this desire if properly carried out, but in the securing of the cheaper varieties it hardly seems fair to threaten the whole list of foods with adulteration. The most disingenuous of all the arguments presented was that of the packers of codfish, who claimed immunity from the provisions of any act under the specious guise of requiring that the judgment which is to be pronounced upon a product to which the external application of a preservative is made and which requires to be macerated or soaked before use, should be pronounced only at the time the material was fit for consumption and not in the state in which it entered the market. This contention had such powerful influence as to meet with approval on the part of both the Senate and the House, and is embodied in a provision of the bill covering the points, as stated above. Apparently, it might seem that this

provision would apply to all preservatives, since they are all applied first externally and are only mingled with the material afterward. The greatest fault of a provision of this kind is its ethical offense rather than its practical application.

OBJECTIONS TO THE USE OF CHEMICAL PRESERVATIVES.

I will try and state now the principal objections to the use of chemical preservatives in foods. In the first place, I may call attention to the fact that they are never necessary except perhaps in some emergencies. I mean that in the ordinary commerce in foods and the preservation of foods necessary to that commerce, the use of chemical preservatives is never a necessity. I will admit without argument that it is far better to have foods preserved with chemical antiseptics than to have no foods at all and, therefore, whenever it is a question between starvation and antisepsis the latter is preferable. Such an emergency, however, in the present constitution of the world is a very remote one. The methods of transportation are now of such a character that if by some misfortune the supply of food should fall short in any locality, it is easily and quickly supplied from other more favored localities. The methods of the sterilization of food products by heat have now reached such perfection that all substances which are not rendered unsuitable for consumption by the application of heat can be easily preserved thereby; that is, vegetables, cooked fruits, cooked meats, fish, oysters, etc., are easily and perfectly sterilized and in this state will keep in edible condition for an indefinite length of time.

Without dwelling too long on a process so well known as sterilization, I may pass to the utilization of a low temperature for the preservation of such food products as are not suitable for sterilization by heat. The magnitude of the cold storage industry has vastly increased in the past few years and its technique been very much improved. There are certain food products which actually improve for a certain time in cold storage, such as fruits, meats, poultry and game. There are other food products which are not improved by cold storage, but which are kept in reasonably good condition for a limited time therein, namely, eggs, fish, butter, etc. While there are often temptations to keep food products too long in cold storage, its immense utility in the proper preservation of foods must not be lost sight of.

In the third place, the old and well-known process of curing food products or preserving them by condimental substances is still of great value and always will be. Not only are foods preserved or cured by these condimental substances, but there are produced during this time certain flavors or aromas which render these foods of high value. The ripening of cheese is an illustration of the changes which take place in foods during the curing process; the flavor of the ham, of bacon and of corned beef are other well known illustrations. Thus the curing process is valuable not only because the condimental substances employed are incidentally of a preservative character, but because some of the natural fermentations which take place during curing are not inhibited by the condimental substances, but go on in a normal way to produce the flavors and aromas which make such cured products so palatable and attractive.

Thus it is seen that there are at the service of man wholly unobjectionable and even useful methods of preserving food products which render it unnecessary to resort to that method of preservation which I might call *vi et armis*, which is the one resorted to by the chemical preservative manufacturer.

Another very grave objection to the use of chemical preservatives is in the fact that it prompts the utilization of unsuitable, partially decayed, or unripe products, or the refuse of factories for food products. It was developed in the evidence before the Interstate and Foreign Commerce Committee that vast quantities of tomato pulp were prepared during the canning season and kept by the addition of a chemical preservative until a less busy season permitted their manufacture into catsups and similar bodies. Such a method of procedure is always a great temptation to utilize the poorest, partly decayed, or refuse matter brought to the factory or otherwise left in the field, and this temptation, unfortunately, is not always resisted. When in addition to a preservative it is permitted to use an artificial color so that these waste products can be made to imitate the best and ripest of tomatoes, the deception is more complete and the temptation more irresistible. This objection to the use of preservatives is well stated by Dr. Vaughan in his testimony before the Senate Committee, February 28, 1900, 55th Congress, page 203. He says, in speaking of a preservative:—

"In the first place, like coloring matter, it enables a man to sell a poor grade article in place of a better grade; in the second place

it enables the manufacturer to be less careful in other means of preservation. For instance, if he is putting up a can of peaches or pears, or anything of that kind, if he will add a little salicylic acid he need not be so careful in his sterilization. That is a very important thing. I do not think salicylic acid or butyric acid, or anything of that kind, ought to be allowed in preserving fruits or jellies because if sterilization is complete these things can be kept without any antiseptic added." The term "butyric" here is doubtless a misprint for "benzoic" since the use of butyric acid as a preservative is not practiced with foods.

I believe, therefore, that the general use of preservatives in the preparation of food products would place a premium on carelessness, dirt and inferiority.

The use of chemical preservatives is also objectionable on the score of health. These preservatives in order to be effective must be in sufficient quantity to either kill or paralyze all bacterial action. It is reasonable to believe that a body powerful enough to do this would be powerful enough to injure the cells of the human body with which it might be brought into contact. This point is well brought out by Prof. W. D. Halliburton, the celebrated physiologist, in his testimony before the English Departmental Committee, page 263, in answer to question 7528, and following:—

"I would say at the outset that the kind of evidence that I have to offer is not very largely clinical. The amount of medical practice which I have seen is limited. Very soon after my student days I took to physiological work, and I have remained at that more or less ever since, so that the actual observations that I have to make are in the nature of physiological experiments, and deal principally with the two chief substances that you have under investigation, as I understand—compounds of boron and formaldehyde. On general principles one would object to the continuous use of antiseptics. The substance which would destroy the life of micro-organisms could not be expected to be beneficial to the life of a higher organism; it would be largely a matter of dose. I mean to say the same dose that would kill a bacterium would not necessarily kill a man, but still it would be hostile to the protoplasmic actions that constitute the life even of a high animal like man.

"Q. 7541 (p. 264). Then, as to boric acid, you have made extensive experiments?—A. With borax and borates I have made

a fair number of experiments. In the introduction I allude to what is known as 'borism.' The eruption occurs on the skin of certain individuals as the result of the use of either boric acid or borax. There have been other cases recorded—although here again I cannot speak personally—in which dyspeptic troubles have arisen. There have been a fair number of experiments performed upon animals.

"Q. 7544. Boric acid is the commoner preservative, is it not?—A. I am not so sure. I think very largely a mixture is used that is called 'glacialin'—a mixture of boric acid and borax. In animals the chief advantage, if one may put it so, of the poison is that it is not cumulative; it does not accumulate in the body, but it is rapidly eliminated by the urine."

Professor Halliburton says further, in answer to question 7572: "May we take it, then, that in your view you are absolutely opposed to the use of formalin? Yes.

"Q. 7573. And with regard to the other preservatives, if they were labeled that would meet your objection; is that your position generally?—A. No; I feel that the ideal condition of things would be to prohibit them all.

"Q. 7574. All preservatives?—A. All preservatives.

"Q. 7575. Even salt?—A. No; I am not speaking of substances which are normal constituents of the body.

"Q. 7576. Would you prohibit nitrate of potash, too?—A. One knows, even from smoking cigarettes, that nitrate of potash is not absolutely harmless."

The celebrated English physician, Sir Lauder Brunton, also gave strong testimony before the English Committee on this subject.

Following is his language:

"Moreover, it seems to me that by the unregulated use of preservatives we may possibly get a double danger, that from the drug itself which is used as a preservative, and that from the decomposing food which may in spite of the addition of a certain quantity of the preservative still undergo change and become dangerous to health."

He further says that he thinks it is desirable to absolutely exclude preservatives from milk. Sir Lauder was asked the following question:

"Q. 7431. Have you formed any opinion as to the relative harmlessness or value of the different chemical preservatives?—A.

I have formed an opinion, but the data upon which I have formed the opinion are so imperfect that I should prefer not to express any opinion."

And further on, in Q. 7432:

"We are unable to form opinions regarding the action of certain drugs from their administration, either to animals or to men, but the length of time over which such experiments extend is too short to allow of a complete opinion being formed in regard to their action."

In 7433, in answer to the question, "Do I understand that you mean the cumulative action of such a drug would not be thoroughly ascertained?" he replied:

"The cumulative action, and possibly something more than the cumulative action; that is to say, the continued action over a length of time, even though there should be no accumulation. To give an example of what I mean—if a man takes a little excess of sulphate of magnesia every morning, so as to cause rather too free purgation, there is no accumulation in the body of the sulphate of magnesia, but yet at the end of a year the continued excessive use of the drug has given rise to a condition of weakness which would not have been present but for this excessive use, and yet there has been no accumulation. I thus distinguish between the cumulative effect and a continued effect."

"Q. 7434. To take the example of one common preservative—boracic acid; the amount of boracic acid which can be voided by the human subject in the course of twenty-four hours is limited, is it not?—A. It is limited, but I do not know the limit.

"Q. 7435. That is one of the elements of uncertainty?—A. Yes; that is an element of uncertainty.

"Q. 7436. Although you might know the exact quantity being taken by a human being, it would be impossible to know whether there was any accumulation going on?—A. It would be difficult to know whether any accumulation was going on, and with the present data before us it would be impossible to say whether any continuous, as distinguished from a cumulative, effect was being produced.

"Q. 7460. Let us take, for instance, a physician who goes into a hospital and prescribes to a patient 10 or 15 grains of boracic acid three times a day; is it a matter of importance to the medical man and to the patient whether that patient may already be taking three times that amount?—A. Yes; I think it is.

"Q. 7461. A serious matter?—A. I think so.

"Q. 7462. And so with other drugs, such as salicylic acid and benzoic acid and other preservatives?—A. Yes."

I need not cite to you the results of our own experiments in this matter. They are so extensive that I could not even summarize them here. I may say, however, that we found all the chemical preservatives which we administered to our young men harmful. These included boric acid and borax, salicylic acid and salicylates, benzoic acid and benzoates, sulphurous acid and sulphites, formaldehyde and sulphate of copper.

One principal argument in favoring the use of any of these preservatives is that they are used only in small quantities, yet who is to be the judge of the quantity? The answer is always, the manufacturer. A "small quantity" is the maximum quantity that he wants to use, no difference what that may be, and he must necessarily use always more than the indicated amount to be certain of results. Should he use less than the amount necessary to kill all the ferments, the application of the preservative would be useless. Therefore it becomes a necessity always to use a sufficient quantity to be certain. The plea which is made by those who want to use preservatives for the privilege of using a minimum amount on the ground of its harmlessness is not an honest one. If the substance which they use is harmless, there seems to be no necessity for limiting the amount of it which they employ; if it is harmful it seems to be unwise to admit any of it into foods.

One of the gentlemen appearing before the committee stood squarely on logical grounds, and when he was discussing the proposition to so limit the power of the Secretary of Agriculture that he could not declare any preservative unwholesome unless it had been so declared by a special committee, Mr. Gardner, a member of Congress from Massachusetts, said in answer to a question by Judge Bartlett, of Georgia:

Mr. Gardner.—"I quite understand that, Judge. If you will read it over, however, I think you will see that it does not mean what the people who have introduced it perhaps think it does mean. At all events, I wish to appear and present my witnesses in behalf of the addition to the Hepburn bill of a paragraph which shall provide a minimum of this sort, and make it impossible for any commission, whether it shall be composed in such a way as was suggested by

Dr. Vaughan this morning or by the selection of the Secretary of Agriculture (in view of the fact that many people who have investigated those subjects are inclined to take a not altogether common-sense and practical view of this question), to prohibit the use of boracic acid, provided it does not appear in excess of one-half of 1 per cent.—the amount stated by Dr. Vaughan this morning as being harmless."

The position of Mr. Gardner is wholly logical if it be conceded that preservatives are necessary.

I also think it is easy to show that when experts testify that a given preservative is harmless they do so with a certain mental reservation. For instance, if a preservative is harmless, why should it not be put into all foods indiscriminately? What is the meaning of the word, "harmful" or "harmless"? I do not think that any one would say of a preservative that it would be harmful to every person who consumed it, but if it hurts one person, if it is injurious to a single individual, it becomes a harmful substance. If a man is indicted for larceny it is not sufficient to prove by a thousand people that he never stole anything from them. That has nothing to do with the case. But if it is proved in a single instance that he has stolen he becomes guilty. And so with the experts who testified before the Interstate and Foreign Commerce Committee—they negative their own arguments and statements by certain admissions respecting the harmfulness of the very bodies which they declare to be harmless. Dr. Vaughan particularly contradicted his own statements respecting the harmlessness of certain preservatives.

I said to the Committee, in reviewing Dr. Vaughan's testimony:

"I believe it is recognized by everyone who has familiarized himself with the facts, that of all common food products milk is the most prone to decay. Doctor Vaughan himself has shown that by result of bacterial action in milk a poisonous substance, which he has called 'tyrotoxicon' is developed, which is very deadly in its effects.

During the summer months especially the newspapers are full of many cases of illness and death due to the consumption of ice cream.

"The rapidity with which bacteria multiply in fresh milk is something phenomenal. Therefore it seems reasonable to believe that if there could be any justification of the use of preservatives in food products it would be in milk. Doctor Vaughan's insistence on

the exclusion of every kind of preservative from milk, as I have already said, is certainly a confession that he believes these things are injurious. But it may be said in extenuation of this that milk is peculiarly the food of the infant. I do not desire to contradict that statement, which is doubtless true. But in what is the digestion of the infant different from the digestion of the adult? In no respect whatever except that of a mechanical difference. The infant is incapable of mastication. Therefore he cannot use solid food. Milk is a perfectly balanced food. It contains all the elements necessary to the sustenance of the body and in proportions best suited for nutrition.

"In case of illness among adults where digestion is disturbed, milk is a most reliable and common diet, since it is easiest digested. Therefore if preservatives interfere with digestion they would have a less harmful effect than on any other food product, because milk of itself is easiest of digestion.

"The process of metabolism in the infant is exactly that in the adult. Metabolism consists in the change of foods, first, into soluble forms and then the change in the character of these soluble forms by absorption into the system, and by utilization in building of tissues, and finally by degradation into excretion products. With the exception of the mechanical division of foods by mastication these two processes are absolutely identical in the infant and the adult.

"It follows, therefore, as a reliable and logical conclusion, that any added substance which renders milk deleterious would have the same effect on any other food in which it might be used."

The particular testimony of Dr. Vaughan to which I refer is found on page 65 of the hearings before the Interstate and Foreign Commerce Committee:—

"I am sure that benzoic acid in the quantities in which it is used in tomato catsup, sweet pickles, etc., one part to 1200 or 2000, does not do any harm. I should be opposed to the use of formaldehyde in milk in any quantity, or the use of any other preservatives in milk. I have testified repeatedly against the use of sulphite of soda on hamburger steaks."

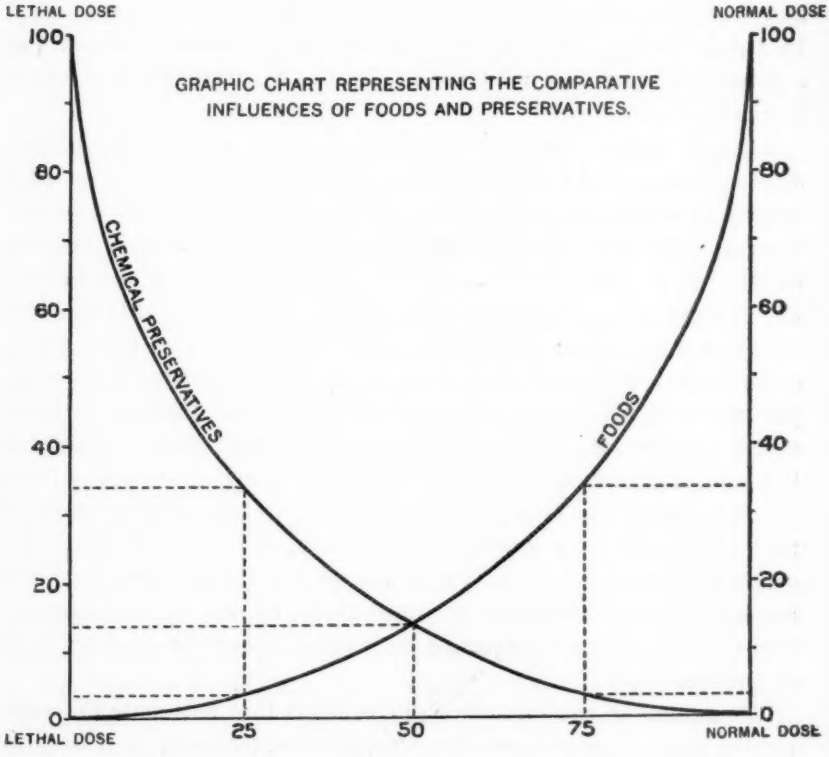
I should refer here again to Dr. Vaughan's testimony relating to the harmfulness of benzoic acid already quoted. If an expert of his experience is uncertain in regard to the harmfulness of two

grains of benzoic acid daily, instead of one grain, by what right of authority should he say that 0·5 per cent. of boric acid in foods is harmless and a greater amount harmful? Such a discrimination is neither logical, scientific nor hygienic. Yet it is upon such testimony it is asked that the authority of the Secretary of Agriculture to consult such experts as he deems advisable in respect of wholesomeness should be denied by an amendment to the food bill, and this matter be determined by a board of five experts appointed by the Secretary, one of whom shall be a physiological chemist, one a pharmacologist, one a bacteriologist, one a pathologist and one a toxicologist.

I cannot better answer the arguments which would indicate that a small quantity of a chemical substance may be used without producing harm than to refer to the chart (p. 166), which I presented to the Interstate and Foreign Commerce Committee. Simply because an effect is so small that it cannot be measured is no reason for denying its existence. Any given measurable quantity is made up of an infinite number of small quantities of the same kind. I believe that every expert will admit that there are certain quantities of chemical preservatives which are injurious, that is, which produce an effect which can be measured. They must also admit that the effect is the sum of an infinite number of small effects and that each of these infinitely small effects is produced by an infinitely small quantity of the preservative in question. We may, therefore, present this graphically as I do in this chart, in which I have compared the normal effects of foods and chemical preservatives by the construction of two curves intersecting each other above the median point of the base line.

We assume in the discussion of this chart that in a state of health no one needs a dose of any chemical preservative and, therefore, the normal dose of a chemical preservative is zero, as represented on the chart. We may represent the lethal dose of a chemical preservative by 100 and may assume three points to be measured on a curve, by means of which it may be constructed or plotted. In the same way we may construct a curve showing the effect of foods in a state of health, in which the normal dose is that which keeps the body in a state of equilibrium and may be represented by 100. The lethal dose of food is, of course, zero. Now it is evident that we cannot measure the infinitely small effect of an infinitely small dose of a

drug, which lies only at an infinitely small distance from zero to the left on the base line, but at the point 75 on the base line we are able to measure the effect of the drug. We can also measure it at the point 50 and at the point 25, and having determined these three points construct the theoretical curve. In the same way we cannot measure the effect of diminishing the normal dose of a food by an



infinitely small quantity, which would be at an infinitely small distance from 100 on the right, in descending toward the base line. We, however, could measure the effect of diminishing the food to the extent represented at the point 80 on the right, or at the point between 40 and 30, or at the point between 20 and 10 on the left, or between 10 and zero, which latter point would be absolute starvation. Thus it is wholly illogical and untrue to state that a small dose of a harmful substance produces no effect. It simply produces no effect

of a magnitude which may be measured, but by the application of the calculus we can determine the magnitude of the effect at an infinitely small distance from either the lethal or normal dose, both in the case of foods and of chemical preservatives.

Thus we have an absolutely irrefutable mathematical demonstration of the fact that even a small dose of a chemical preservative in a state of health is harmful. I am not unmindful of the fact, however, that practically every one of these chemical preservatives may become a useful medicine in pathological conditions, but this is no argument whatever for supposing that they are helpful in physiological conditions. Practically every one of the chemical preservatives adds a certain amount of labor to the excretory organs of the body. These organs have already all they ought to do in normal conditions and, therefore, to overload them even by a very small burden is illogical and unhygienic and must sooner or later lead to harm. In fact, I do not know of any more untenable argument in favor of the use of preservatives than the *argumentum de minimis*. From a medical point of view, too, the use of substances constantly in the food which are used as medicines is highly objectionable. The testimony of Sir Lauder Brunton before the English Departmental Committee is very pertinent and I quote it here, in answer to question 7464:

"Q. 7464. Then, with regard to the use of salicylic acid, may I just read you this: 'Sometimes, however, the salicyl compounds so irritate the kidneys as to cause albuminuria and even hæmaturia, and they must be used with great caution when given for this or other purposes if renal or hepatic disease be present, and in aged persons, inasmuch as under their influence there is an increase of the amount of uric acid waste and they are apparently not diuretic. The salicylates are believed by some authorities to be harmful in gout.' Assuming that, again, to be true, do you see in that an objection to the indiscriminate use of salicylic acid?—A. To the indiscriminate use, certainly; and that, I think, affords a very strong proof of the correctness of my suggestion that preservatives should not be allowed to be used without the person who is using them knowing that he was taking them, because in the great majority of cases salicylic acid will not produce those symptoms, but there are certain individuals who might be thus affected. If salicylic acid is allowed to be used without its use being notified to the consumer

he may be suffering from those symptoms while he himself and his medical man are totally in the dark in regard to the cause of the symptoms, whereas if he is notified that the milk or other food which he is taking contains a certain proportion of salicylic acid the attention of the medical man would probably be at once directed to the possibility of salicylic acid having been the cause of the symptoms."

The above extract from the testimony before the Departmental Committee it seems to me covers the whole ground in a nutshell. The reason that Sir Lauder Brunton is in favor of labeling foods which contain preservatives is to enable the medical men in cases of disease to ascertain what the causes of this disease have been. Certainly a more sweeping statement respecting the harmful quality of preservatives cannot be found in medical literature and this opinion of his commends itself strongly to the medical fraternity.

I have briefly summarized the present state of the question touching the use of preservatives in foods. I have not mentioned, however, the rights of that vast majority of consumers who desire that their foods shall not be treated with any chemical antiseptic of any description. The rights of the consumer, in my opinion, are paramount to those of trade, and the people of this country who desire to eat their foods without chemical antiseptics surely ought to have the privilege of doing so. The proposition, it seems to me, has become a purely ethical one. It is simply this: On the one hand, shall a few men engaged in the manufacture of food products, in order that they may increase their profits by a small sum, be permitted to use upon foods which enter into common consumption chemical preservatives which the great mass of the people will either have to eat or do without the articles in question? On the other hand, shall the rights of the great mass of consumers be conserved so that in the purchase of food products they may be certain that they do not contain any drugs or chemicals and that they are pure and wholesome?

We have now in this country a wave of ethical reform which I hope may not recede for a long time. The people are awakened to a sense of their rights and also to a conception of the frauds of every description which have been so persistently practised upon them. No one will deny any citizen the right to use such chemical preservatives as he pleases in his own food. He can have salt-cel-

lars filled with the whole list of preservatives upon his table and use them to his heart's content, but the day I think has passed when the food manufacturer may with impunity place in his goods the very substances which the physician can use only after years of study and after passing an examination, and which the druggist cannot sell without a physician's prescription. The people have rights and they will dare assert them, and the greed of gold and the concupiscence of trade must give way to the broad ethical principle which forbids the use of drugs in foods.

"Or what man is there of you, whom if his son ask bread, will he give him a"—drug?

LIQOUR CRESOLIS COMPOSITUS.

By Charles H. LaWall and E. Fullerton Cook.

The use of crude carbolic acid of the Pharmacopœia of 1890 in preference to the purified phenol for general disinfecting purposes was not based alone upon economic reasons, but was due to the fact that the so-called crude carbolic acid was in reality not carbolic acid at all, but that it consisted mainly of homologues having more energetic properties than the phenol itself, namely the cresols.

The recognition of this fact was quickly taken advantage of by manufacturers of proprietary disinfectant and antiseptic solutions. The cresols were separated by fractionation, the three homologues being combined in the one liquid, known under the trade name "Cresol," and as the physical properties were dissimilar from phenol in the fact that cresol is almost insoluble in water, preparations were devised to overcome this difficulty by combining the cresol with some form of soap, which combination was found to be the most advantageous method of using it.

The widespread popular use of some of these preparations led the Revision Committee of the Eighth Revision of the U. S. P. to include cresol in the list of medicinal substances, and to give a formula for a soluble preparation of the same.

Several complaints having reached the ears of the authors of this paper, both as to the quality of the commercial cresol on the market and the practicability of the working process for the compound solution, it was considered worthy of a little experimentation as to the facts in the case.

Seven samples of cresol were obtained from various sources, representing articles of German, English and American manufacture. These were examined as to the boiling point, specific gravity, and solubility, after which samples of the compound solution were made from each one of them and the properties compared.

The Pharmacopœial requirements on these points are as follows: Boiling point 195 to 205° C.; specific gravity 1·032 at 25° C.; soluble in 60 parts of water at 25° C. A sample of crude carbolic acid was included in the list for purposes of comparison (see No. 4).

Sample.	Specific Gravity.	Boiling Point.	Solubility.
1.	1·032	197–203 C.	1–70
2.	1·037	192–201 C.	1–60
3.	1·045	194–201 C.	1–60
4.	0·979	188–268 C.	insoluble
5. Amer.	1·0383	194–203 C.	1–60
6. Eng.	1·0363	194–203 C.	1–80
7. Ger.	1·0316	195–204 C.	1–100

These figures indicate that so far as the boiling point is concerned, all of the samples are very close to the U. S. P. requirements, but that as regards solubility and specific gravity there is quite a variation from the official figures. This variation may in part be due to the varying proportions of the three isomers which go to make up the official substance.

In connection with the test for solubility it was noticed that not one of the samples made a perfectly bright clear solution, but that all contained varying proportions of a flocculent material which was not dissolved even after the addition of a large excess of water and standing for some time. The point of complete solubility was therefore taken as the point when there was neither a milky turbidity nor the separation of oily drops. All of the cresol samples answered the U. S. P. requirements for absence of hydrocarbon oil by being perfectly soluble in sodium hydroxide solution.

The consideration of the solutions was then taken up, and samples of the solution were made up according to the U. S. P. directions from Nos. 1 and 2. It was noticed that a preparation was afforded which was not immediately soluble in water, and which did not acquire solubility even after a few hours standing as stated in the official process. The sample was therefore allowed to stand and was tested at intervals to ascertain the length of time that

would be required for the completion of the reaction, if one there was, and it was found that the sample which was at first quite turbid and which made a very milky mixture when poured into water, became gradually clearer, and produced less and less milkiness when added to water, but that the time for the completion of the preparation was three weeks. Another experiment was made later, again testing from day to day, and it was found that this time it required two weeks and five days for the production of a soluble preparation.

Samples of the solution were then made up, using the official proportions of all of the ingredients, but altering the working formula so as to complete the reaction between the linseed oil and the potassium hydroxide before adding the cresol.

This modification of the formula was found to answer perfectly for producing a preparation which is transparent as soon as completed, and which mixes clear with all proportions of water without any delay whatever. The actual working process is as follows:—

A soft soap is first prepared, using the same amounts of linseed oil and potassium hydroxide as directed for the preparation of the official compound solution of cresol. The details of the process, on the small scale may be the same as that directed for the U. S. P. soft soap.

Heat the linseed oil (350 grammes) in a deep capacious vessel, on a water bath, to a temperature of about 70° C. Dissolve the potassium hydroxide (80 grammes) in 450 cc. of water, warm the solution to about 70° C., add it to the linseed oil and mix thoroughly. Then incorporate 40 cc. of alcohol and continue the heat without stirring until a small portion of the mixture is found to be soluble in boiling water without the separation of oily drops. The soap, thus prepared, is now dissolved in 500 grammes of cresol and a sufficient quantity of water added to make the solution weigh 1000 grammes.

This solution may be immediately mixed with water, in any proportion, forming a clear liquid, and will correspond with the official solution in strength and content.

Other suggestions have been made for the extemporaneous preparation of this solution, such as the replacing of the linseed oil by a more readily saponifiable oil, as cotton-seed oil, but as this would modify the preparation to the extent of changing the soap and

lightening it in color, it could not replace the official solution when that is prescribed. Such a modification might be made to advantage when the official solution is not required.

The amount of soap used in the official solution seems to be needlessly large, two-thirds of the amount directed has given equally satisfactory results.

Care should be taken to avoid heating the liquid after the cresol has been added, since it is quite volatile and the vapor is inflammable.

LONDON BOTANIC GARDENS.

By Pierre Élie Félix Perrédès, B.Sc., F.L.S.,
Pharmaceutical Chemist.
A Contribution from the Wellcome Research Laboratories, London.

(*Continued from p. 121.*)

IV.

THE CHELSEA PHYSIC GARDEN.

Before commencing an account of the Chelsea Physic Garden, it will be necessary to give a brief *résumé* of the origin and development of the society by which the garden was founded. The Society of Apothecaries of London—in Latin, "*Societas Pharmacopœiorum Londinensis*," or "*Societas Pharmaceutica Londinensis*"—was incorporated by Royal Charter in 1606, and was then united with the Grocers' Company, an ancient City guild. The existence of the Society as an independent body dates from 1617, when a new charter was obtained from James I, and the Society severed its connection with the Grocers' Company.

The Society of Apothecaries, or "*Societas Pharmaceutica Londinensis*," must not be confounded with the Pharmaceutical Society of Great Britain, the latter having been established in 1841, incorporated by Royal Charter in 1843, and made, by the Pharmacy Acts of 1852 and 1868, the only legal body in the United Kingdom for the examination and registration of pharmacists. It may seem strange to the American reader that the title of "apothecary" should not be synonymous with that of "pharmacist," and in order to explain this apparent anomaly, we must go back to an early date in the history of the Society of Apothecaries. The "apothecary," at the time of the Society's inception, and for a considerable period

STUDENTS' ENTRANCE TO THE CHELSEA PHYSIC GARDEN, IN SWAN WALK.

thereafter, was nothing more nor less than a compounder of drugs, or dispenser, and the term is still used in this sense in the United States. By the end of the seventeenth century, however, the practice of prescribing drugs as well as that of dispensing them had been assumed by the apothecary, and by a decision of the House of Lords, in 1703, it was definitely settled that the directing and ordering of remedies was, no less than their preparation, a legimate part of the apothecaries' functions. The powers of the Society of Apothecaries were further extended by the Acts of 1748 and 1815, which restricted the practice of the apothecary's art to such as were duly licensed by the Society. These restrictions only applied to London and its environs at first, but, by the latter Act, were made to comprise the whole of England and Wales. By these two Acts the Society was also empowered to appoint a board of examiners, and it is a significant fact that our existing medical schools are, in a great measure, the outcome of the evidence of training required from candidates by this board. The Society has, indeed, been a pioneer in the cause of education on more than one occasion, and, in 1850, it imposed a preliminary examination in arts on its prospective licentiates. This examination may be looked upon as the forerunner of the preliminary knowledge in arts that is now essential for registration as a medical student in the British Isles. By the Medical Acts of 1858 and 1886, the licentiateship of the Society of Apothecaries was recognized as a complete legal qualification for the practice of medicine, surgery and midwifery throughout the United Kingdom and Ireland. In the early days of the Society's existence the knowledge of the "art and mystery" of the apothecary was acquired through apprenticeship, and it is on record that the Society examined its apprentices as early as 1619; by the Act of 1815 a five years' apprenticeship to an apothecary was made obligatory on every candidate for the license, but this restriction was removed by the Apothecaries' Act Amendment Act of 1874, and apprenticeship is now no longer necessary.

In addition to the licentiateship, the Society of Apothecaries grants a dispenser's certificate, but this is of limited value, as it practically restricts its possessor to the work of dispensing for medical men; the Pharmacy Acts cited above making it unlawful for any person not registered under those Acts "to sell or keep open shop for retailing, dispensing or compounding poisons," or to assume the

name of "pharmacist," "chemist" or "druggist." The "apothecary" himself, however, that is to say, the *licentiate* of the Society of Apothecaries, is free to practise pharmacy if he be so disposed, as the penalties imposed on persons who are not registered under the Pharmacy Acts do not apply to medical practitioners.[1] The Society of Apothecaries, as a matter of fact, conducts an open pharmacy of its own at its hall in the vicinity of St. Paul's Cathedral. In connection with this section of the Society's work, it is of interest to note that a laboratory for the preparation of drugs was erected in 1671, and that a "selling place" existed in 1672, as shown by the Society's records. Drugs were only sold to apothecaries at first, but as time went on the Society developed an extensive business with the East India Company and other bodies, and, finally, the retail department was opened in 1822.[2]

We will now proceed to consider in greater detail the activities of the Society in promoting the study of botany, as exemplified more especially by the establishment of the Physic Garden at Chelsea and by the maintenance of the latter during two and a quarter centuries.

It is on record that the members of the Society of Apothecaries interested themselves in botanical pursuits soon after their incorporation, and that they made periodical excursions in search of plants early in the seventeenth century. We are indebted to Thomas Johnson, editor of Gerarde's Herbal, and one of the Society's members, for several accounts of these early "Herbarizings" as they came to be called. By 1633 an annual General Herborizing was definitely instituted,[3] while other less formal ones were also undertaken from time to time.

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[1] To this brief explanation of the status of the licentiate of the Society of Apothecaries, it is necessary to add a few particulars in order to give an exact presentation of the facts. The diploma of "Licentiate of the Society of Apothecaries" does not of itself authorize its possessor to act as a medical practitioner, but it entitles him, in common with the holders of other degrees and qualifications in medicine and surgery, to have his name placed on the British Medical Register, on payment of the requisite fees. The person so registered becomes, *ipso facto*, a legally recognized medical practitioner, to whom the above-mentioned provisions of the Pharmacy Acts do not apply.

[2] Those interested in the history of the Society may consult Mr. Barrett's "History of the Society of Apothecaries of London" for further particulars.

[3] According to Pulteney ("Historical and Biographical Sketches of the Progress of Botany in England," London, 1790) these annual Herborizings were subsequently discontinued for many years, but were systematically renewed after the foundation of the garden.

The annual excursions were confined to the members of the Society and their friends, and those who participated in them were known as "Socii Itinerantes." From Johnson's account of these excursions we learn that the itinerant members used to travel considerable distances, sometimes going as far afield as Anglesea or Bath. The number of members taking part in the excursions appears to have dwindled as time went on, and the task of collecting plants for the General Herborizing came to be associated with the duty of the Society's Demonstrator of Plants. This is made apparent by the following abstract from the instructions issued in 1773 by the Garden Committee, in connection with the office of Demonstrator of Plants:—"He [*i. e.*, the Demonstrator of Plants] is expected to make some annual excursion, for two days at least, preparatory to the Society's General Herborizing, inviting two or three of the ablest botanical members to his assistance. The intention being to collect such vegetables as are not commonly found in the environs of the metropolis, to be demonstrated by him at the meeting appointed for that purpose . . . ." The plants thus collected were exhibited to the members on a day specially appointed for the purpose in July. The office-bearers of the Royal Colleges of Physicians and Surgeons were invited to these exhibitions, which were held, until 1836, at some inn in the suburbs. At this function the Demonstrator gave to the assembled guests a description of the specimens collected and the demonstration was followed by a dinner where "haunches of venison formed conspicuous elements of the entertainment." With the advent of Lindley as Professor of Botany and *Præfectus Horti*, in 1836, the practice was inaugurated of holding the annual exhibition of plants and General Herborizing at the Society's hall instead of at an inn. When the office of Professor of Botany and *Præfectus Horti* was abolished in 1853 the annual exhibition inevitably disappeared with it,[1] although the dinner was continued.

The other herborizings to which allusion has been made were designed to meet the needs of the Society's apprentices. Five of these in each year were ultimately established, viz., two in May, one

[1] It is reasonable to assume that these botanical demonstrations were kept up during the whole period of Lindley's tenure of office, as there is no record of his rôle having been modified in this direction. I have, however, been unable to find any overt indication of the fact.

in June, one in July, and one in August, but there are no means of determining the exact period at which a definite series of these students' herborizings was instituted. It is apparent, however, that the organization of these excursions cannot have been far removed from the creation of the office of Demonstrator of Plants, and the duties of that functionary at these herborizings were defined in the previously mentioned instructions of 1773 as follows:—"He is to accompany and conduct the students of this Society in their search after indigenous plants, upon every day appointed for their private Herborizings, which are only five in each summer; when he is desired to use his best endeavors to preserve strict decorum among his pupils, and for directing and confining their attention solely to the intended business of the day." The details of the excursions are of the greatest interest, but we must needs content ourselves with a brief description of their salient features. These excursions invariably took place in the neighborhood of London, and were of one day's duration. The students met the demonstrator early in the morning at some place previously decided upon, and the members of the party, provided with their collecting boxes, set out on their journey through the suburbs, collecting plants on the way, and halting for breakfast at some inn. The business of the day then began in earnest, and the students, accompanied by the demonstrator, collected specimens and made observations. The route was varied on different occasions, the party sometimes returning to the breakfasting place, at other times proceeding further afield, but whatever the route might be, dinner at an inn was always provided at the end of the journey. At the conclusion of the meal the demonstrator described the peculiarities of the specimens which he had collected, before the student audience, laying special stress on the therapeutical properties of such plants as were used in medicine. Tea then followed and the gathering dispersed for home, the students usually accomplishing the return journey on foot. These students' herborizings appear to have been continued uninterruptedly until 1834, but they were abolished in the following year, owing chiefly to the ever-increasing extension of the metropolitan area and consequent inaccessibility of suitable localities for field work in botany.

Coming now to the garden itself, we find ourselves confronted with a mass of detail which renders a subdivision of the subject-matter desirable in order to give some continuity to the account

The administrative and material details may conveniently be considered first, and we shall accordingly begin with these; a *résumé* of the botanical work accomplished in connection with the garden will then be given; and the whole account will be concluded by a general description of the garden under the present administration.

The ground now occupied by the Chelsea Physic Garden was originally leased from Charles Cheyne by the Society of Apothecaries in 1673 for a term of sixty-one years. The immediate object which the Society's members had in view in taking this lease was the acquisition of a suitable spot near the river for the erection of a barge-house, as it was customary for the City companies at that time to possess a state barge for participation in the Lord Mayor's show and similar functions. The plot of ground thus acquired was nearly four acres in extent, so that a part of it was utilized by the proprietors of the Laboratory Stock for growing medicinal herbs, and plants were transferred to it from the Society's garden at Westminster.[1] A wall was built around the Chelsea Garden in 1674 at the expense of fourteen of the Society's members, on the understanding that the Court of Assistants would contribute £2 every year forever to each of the six herborizings. A sum of £50 was also contributed towards the cost of this wall by the proprietors of the Laboratory Stock in return for the privilege given to them of growing herbs for their own use in the garden. A gardener must have been employed very soon after the garden was established, for it is recorded that a man named Piggott, who had served in that capacity, was dismissed in 1677. Richard Pratt was chosen in his stead, and a lodging was provided for him in addition to his salary. In 1679 the first committee of management, consisting of the extraordinary number of seventy-one persons, was appointed, and, in 1680, John Watts, a member of the Society, and one of the fourteen contributors to the cost of the wall, was elected gardener, with "the allowance of one or two laborers" besides his salary. A "stove" was erected in the following year in the lower part of the garden, near the river, and, in 1683, four young cedars of Lebanon, the first grown in this coun-

[1] Little is known of this garden, but it is evident, from an entry in Evelyn's Diary, that a Physic Garden was in existence at Westminster in the middle of the seventeenth century. It is also evident that the Society subsequently became connected with it in some way, for an arrangement was made in 1676 for removing the plants from thence to the Chelsea Garden.

try, were planted. (For the positions which they occupied see "9" on Plate XXV). Two of the trees died after about a century's existence, and were cut down (1771); of the remaining two (see Plate XXIII), one died in 1875, and the other was removed in 1904.[1] By 1685 the expenses of the garden began to assume such considerable proportions that a plan was adopted in that year by which the entire management of the garden was handed over to Watts for seven years, on the condition that the garden and the buildings therein were to be kept in good order and that a catalogue of all the plants was to be prepared. He was allowed an annual sum for these services, in addition to all expenses incurred in cultivating the ground used by the proprietors of the Laboratory Stock. Each member of the Society was allowed a key of the garden at his own expense.

It was during the first year of Watt's lease that Evelyn visited the garden, and it will not be without interest to reproduce his entry, as it gives us some insight into the condition of the garden at that date (1685):—

"7 Aug. I went to see Mr. Wats, keeper of the Apothecaries Garden of Simples at Chelsea, where there is a collection of innumerable rarities of that sort particularly, besides many annuals, the tree bearing jesuits bark, which had don such wonders in quartan agues. What was very ingenious was the subterranean heate, conveyed by a stove under the conservatory, which was all vaulted with brick, so as he has the doores and windowes open in the hardest frosts, secluding only the snow."[2]

After the expiration of Watt's lease in 1693, Samuel Doody, F.R.S., also a member of the Society, took over the charge and management of the garden on terms similar to those previously made with Watts. This arrangement, however, soon proved unsatisfactory and Doody was absolved from his obligations in 1695; but it is nevertheless probable that he continued to manage the affairs of the garden until his death in 1706. After Doody's decease the

[1] A limb was blown off in 1812 from one of these cedars, and from it a chair was made. In 1846 another limb was broken off in the same way, but whether from the same tree or not, is not stated, and from this *four* chairs were made.

[2] Textually rendered from Bray's edition of the Diary. The abstract previously given in the introductory chapter was taken from the emended version in Field's work (see AMERICAN JOURNAL OF PHARMACY, October, 1905, p. 454).

Chelsea Physic Garden (*circa* 1850) from the River, before the construction of the Chelsea Embankment.

relinquishment of the garden was seriously contemplated, but a committee, which was specially appointed to decide the question, resolved upon its retention; and an arrangement was made in 1708 by which the garden was leased to such members of the Society as chose to subscribe a sum of £100 per annum among themselves towards the upkeep of the garden. This utterly unworkable scheme had to be abandoned before long, and, in 1713, definite fees were imposed on the Society's constituents. In 1714 it was decided that, for the time being, the garden should be maintained by the Corporation.[1] From this date until 1722 the affairs of the garden were in a somewhat unsettled condition, and the gardener or gardeners employed were evidently unimportant officials, as there is no gardener mentioned by name in the Society's records during that period. The decrease in importance of the post of gardener was accompanied by a correspondingly increased importance in that of Demonstrator of Plants. We have already seen that John Petiver, F.R.S., officiated in the latter capacity in 1709, and although it is more than probable that he had occupied the post for some time previously, the circumstances connected with the garden at this time were undoubtedly such as to bring him in close contact with its affairs, and to pave the way for the step which was taken in 1724 of entrusting the direction of the garden to his successors in office. In 1712 Dr. Hans Sloane[2] purchased the manor of Chelsea from

[1] The term "the Corporation" has been used, throughout this chapter, to denote the Society of Apothecaries of London, in its capacity as a corporate body. This explanation is rendered necessary by the fact that the Corporation of the *City* of London is generally known as "The Corporation."

[2] Hans Sloane was born in Ireland in 1660, of Scotch parents. He went to London about his nineteenth year to study medicine, and while there he came into contact with Ray the naturalist. This association was instrumental in developing his taste for botanical subjects, and during his subsequent stay in Paris in 1683 he attended lectures on botany by Tournefort, as well as on anatomy by Duverney. After leaving Paris Sloane went to Montpelier where he became acquainted with the celebrities of its University and commenced his collection of plants. After travelling in Languedoc to increase his collection, he returned to London in 1684. He was elected a Fellow of the Royal Society in 1685, and a Fellow of the Royal College of Physicians in 1687. In the latter year he accompanied the Duke of Albermarle to Jamaica, where he further enriched his collection by the addition of a number of tropical plants. After an absence of fifteen months Sloane returned to London; became Physician to Christ's Hospital in 1694; married the daughter of a wealthy alderman in 1695; became Secretary of the

William, Lord Cheyne, and, as the Society's garden formed part of this estate, a deputation from the Society waited upon its new owner in 1714 to confer with him respecting the affairs of the garden. The immediate result of this conference is not known, but it can be safely surmised that the events which we are about to describe were the ultimate outcome of the interview. A second conference with Sir Hans Sloane took place in 1718, in which the affairs of the garden were again discussed, and within a few weeks after the event Sir Hans Sloane intimated that he was prepared to transfer the property to the Society on certain conditions. In conformity with his promise he conveyed the garden to the Apothecaries' Society by deed in 1722. It was stated in this deed that the conveyance was made "to the end that the said garden might at all times thereafter be continued as a physick garden, and for the better encouraging and enabling the said Society to support the charge thereof, for the manifestation of the power, wisdom, and glory of God in the works of the creation, and that their Apprentices and others might better distinguish good and useful plants from those that bore resemblance to them, and yet were hurtful, and other the like good purposes."[1] These objects had already been aimed at by the Society, but the garden had also been utilized up to this time for the cultivation of medicinal plants to be converted into drugs for the Society's use. By the present deed the latter practice was prohibited. Among the other important conditions of the grant were the fol-

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Royal Society in 1693, a vice-president in 1712, and president in 1727; was created a baronet in 1716; became president of the Royal College of Physicians in 1719; and was appointed Physician to the King in 1727. Sir Hans Sloane continued as president of the College of Physicians until 1735, and died in 1753. At his death his collections of plants and other objects of Natural History, together with his library and MSS., were purchased by the nation for £20,000. These collections formed the nucleus of the British Museum, opened in 1759. Sloane was the author of a work entitled the "Natural History of Jamaica," in which he adopted the classification of Ray. He also contributed several papers to the "Philosophical Transactions." Sloane had four children; two of these, both daughters, "survived their parents, and carried their wealth to the noble families of Stanley and Cadogan." For a critical estimate of this remarkable man, who was at once a fashionable physician and scientific dilettante, see "Encyclop. Brit.," 9th Ed., Vol. XXII, p. 160.

[1] This passage, although placed in inverted commas, has, for convenience, been transferred from the present to the past tense.

lowing :—£5 per annum were to be paid to Sir Hans Sloane or his heirs forever; "fifty specimens of distinct plants, well dried and preserved, which grew in their garden the same year, with their names or reputed names," were to be delivered yearly to the "President, Council and Fellows of the Royal Society of London" until the number of two thousand had been attained, and "those presented in each year" were "to be specifically different from [those of] every former year;" no other buildings but those legitimately connected with a physic garden were to be erected, but the barge-house was allowed to remain. In the case of non-fulfilment of these conditions by the Society of Apothecaries, Sir Hans Sloane or his heirs were empowered to enter into possession of the garden and to hold it in trust for the benefit of the Royal Society, or, failing this, of the Royal College of Physicians, on conditions similar to those imposed on the Society of Apothecaries. Power was also reserved for the President and Vice-President of the Royal Society and of the Royal College of Physicians to visit the garden "once or oftener in every year" to ascertain whether the conditions specified were "duly observed and complied with" by the Society of Apothecaries. These conditions have, on the whole, been faithfully complied with by the Society, but payment of the annual rent does not appear to have been enforced by either Sir Hans Sloane or his heirs. The annual delivery of plants to the Royal Society seems to have taken place at irregular intervals, but the condition as to number was more than fulfilled, for with the last presentation, in 1794, a total of (at least) 2550 specimens had been attained.

The members of the Society having come into permanent possession of the garden, they directed their energies toward its reorganization. A committee was appointed for the purpose of administration, and, on the recommendation of the committee, the gardener then in charge was dismissed[1] and Philip Miller chosen in his place. The post which the latter so honorably filled was occupied uninterruptedly until 1887 by the following in succession: Philip Miller, F.R.S. (1722–1770); William Forsyth, F.L.S. (1770–1784); John

[1] Tradition had it that he was Philip Miller's own father, but Mr. Barrett has discovered an entry in the Society's records giving his name as Charles Gardiner. Henry Field, writing in 1820, made the statement that the records of the Society were silent upon the subject.

Fairbairn (1784–1814); William Anderson, F.L.S. (1814–1846); Robert Fortune (1846–1848); Thomas Moore, F.L.S. (1848–1887). The title of "Gardener" was changed to that of "Curator" during William Anderson's term of office.

The funds necessary for the re-arrangement of the garden and the repair of the buildings which it contained were raised by means of fees imposed upon the freemen of the Society and by an annual grant from its corporate funds, while the Royal College of Physicians assisted with a gift of £100. In 1724, on the recommendation of the Garden Committee, the Demonstrator of Plants, Isaac Rand, F.R.S., was appointed Director of the Garden or *Præfectus Horti*, his duty in the latter capacity consisting in the superintendence and frequent inspection of the garden, while as demonstrator he was required "to attend in the garden during the six summer months, at least twice in each month, to demonstrate the plants to such as should then attend, and to execute such other matters as were by former orders enjoined." This office, like that of the gardener or curator, was held uninterruptedly for a considerable period, and the following filled the post in succession until its abolition in 1853: Isaac Rand, F.R.S. (to 1743); Joseph Miller (1743–1747); John Wilmer (1748–1764); William Hudson, F.R.S. (1765–1771); Stanesby Alchorne (Honorary) (1771–1772); William Curtis, F.L.S. (1773–1777); Thomas Wheeler, F.L.S. (1778–1820); James Lowe Wheeler (1821–1834); Gilbert Thomas Burnett, F.L.S. (1835); John Lindley, F.R.S. (1835–1853). James Lowe Wheeler was the first Demonstrator of Plants to whom the title of "Professor of Botany" was applied, but the terms "Professor" and "Demonstrator" were for some time used conjointly.

In 1732 important additions to the equipment of the garden were begun. These additions, consisting of a greenhouse and two stoves (see "1," "2," and "3," Plate XXV), were completed within two years; the expenses incurred in the undertaking were met by subscription among the members of the Society, and by a contribution from the Corporation. The first stone was laid by Sir Hans Sloane, and, in the following year, it was decided to erect a statue of him in the garden. This statue, the work of Michael Rysbrach, was completed in 1737 and placed in a niche in the front wall of the greenhouse. It was removed in 1748 to the position it now occupies in the centre of the garden and placed upon a pedestal

STATUE OF SIR HANS SLOANE, IN THE CHELSEA PHYSIC GARDEN.

which, like the statue itself, is of marble (see Plate XXIV). The following inscriptions were engraved on the pedestal in 1751 :[1]

HANS: SLOANE Bar: Archiatro
Insignissimo Botanices Fautori
Hoc honoris causa Monimentum.
Inque perpetuam ejus memoriam.
Sacrum voluit
Societas Pharmacopœior: Londinens:
MDCCXXXIII.

THEY
Being Sensible how necessary
that Branch of Science is
to the faithful discharging the Duty
of their Profession,
With grateful Hearts
and general Consent
Ordered *this* Statue *to be Erected*
In the year of our Lord 1733,
That their Successors and Posterity
may never forget
their Common Benefactor.

Placed here in the Year 1737.
Sr. Benjamin Rawling, Knt. *Master*
Mr. Joseph Miller } *Wardens.*
Mr. Joseph Richards }

(*To be continued.*)

U. S. PHARMACOPŒIAL BUSINESS AFFAIRS.

The Board of Trustees met at Pittsburg, December 2d. Members J. H. Beal, A. E. Ebert, J. P. Remington, S. A. D. Sheppard, and H. M. Whelpley were present. Horatio C. Wood was absent. Secretary Murray Galt Motter has issued to the members the official minutes of the proceedings. A resumé of the work of the Committee of Revision to be published in convenient form was discussed, but no definite action taken by the trustees.

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[1] According to Barrett the Latin inscription which was to be cut on the statue of Sir Hans Sloane was finally decided upon on August 22, 1771, and its terms are inserted in the minute-book in full.

An edition of the Pharmacopœia in the Spanish language will, no doubt, be one result of the recent meeting. A committee consisting of Professor J. P. Remington, Chairman of the Committee of Revision; Charles E. Dohme, Chairman of Board of Trustees; and Dr. H. C. Wood, President U.S.P. Convention, was appointed to make the preliminary arrangements for an edition of 2,000 copies. The discussion developed the fact that great interest is being taken in the proposition.

Dr. Walter Wyman, Surgeon-General of the Marine Hospital and Public Health Service, was tendered a special vote of thanks for the publication of Bulletin No. 23 entitled, "Changes in the Pharmacopœia of the U. S. of A., Eighth Revision." Also, for the bulletin on Standardization of Diphtheria Antitoxins. A vote of thanks was also tendered Dr. Reid Hunt and Dr. Murray Galt Motter, of the Service, for their work on Bulletin No. 23.

With a view of bringing the Pharmacopœia to the direct attention of medical students, it was decided to present the professors of materia medica in the medical colleges with complimentary copies of the Pharmacopœia. The recipients of such copies will be requested to call the students' special attention to the purpose of the Pharmacopœia and the nature of official remedies.

The extent of additional honoraria to members of the committee of revision was considered at length, but action postponed until the next meeting of the board.

Several applications from publishers who desire to use portions of the text of the U.S.P. were discussed and the rate of compensation decided upon.

The Board adjourned to meet at the new Willard Hotel, Washington, D. C., January 20, 1906.

The Pittsburg College of Pharmacy tendered the Board of Trustees an informal dinner.

HENRY M. WHELPLEY, *Secretary*,
U. S. Pharmacopœial Convention.

NORTH CAROLINA BOARD OF PHARMACY.

At a meeting of the North Carolina Board of Pharmacy, held in Raleigh, N. C., on November 21, 1905, the following resolutions were unanimously adopted:

Resolved, That it is the sense and ruling of this Board for the purpose of allowing for attendance in reputable schools and colleges of Pharmacy as part of the three years' experience required in Pharmacy of applicants for license, that such institutions shall:—

(1) Be incorporated as a college or school of pharmacy, or be a department of a regularly incorporated educational institution, or a department of a State University, or conducted by an incorporated pharmaceutical society.

(2) That the institution shall include in its courses of instruction oral lectures, personal laboratory work, recitations and reviews. This shall exclude work in absentia.

(3) That the institution shall require of each candidate for graduation not less than 500 hours given to lectures and recitations, and not less than 600 hours of laboratory work, such work to be given in a period of not less than forty weeks.

F. W. HANCOCK,
Secretary and Treasurer.

ILLINOIS BOARD OF PHARMACY.

Extract from the report of the special committee on the address of the President of the Illinois Pharmaceutical Association at the annual meeting in August, 1905. Adopted by the association without a dissenting vote:

"The objects of the Illinois Pharmaceutical Association as expressed in the Constitution being to promote the advancement of pharmacy and of those engaged in its practice to a higher professional standing, the support and encouragement of education and a more thorough preliminary schooling and greater scientific requirements for the practice of pharmacy. Therefore your committee believes that at this time action should be taken to place Illinois abreast of New York and Pennsylvania in the thoroughness of the pharmaceutical training demanded by law."

Resolution presented by Prof. W. B. Day at the August meeting of the Illinois Pharmaceutical Association and unanimously adopted:

"WHEREAS, The object of all Pharmaceutical legislation is to promote sufficient special training for pharmacy, and

"WHEREAS, The progress of medical science carries with it greater demands upon the pharmacist than ever before, and

"WHEREAS, The recent pharmacopœias of all countries require more extended technical education for their proper interpretation and observance, and

"WHEREAS, In view of these considerations, the States of New York, Pennsylvania, Wisconsin, Ohio and South Dakota have already advanced the educational requirements for registration in pharmacy beyond the existing requirements in Illinois; therefore, by the Illinois Pharmaceutical Association be it

"*Resolved*, That the Board of Pharmacy of Illinois be requested to take such action toward increasing the requirements for the registration of registered pharmacists, under Section 4 of the pharmacy law of the State, as may place this State upon an equality with the States named, to as great an extent and at as early a date as may, by the said board, be deemed practicable."

PHILADELPHIA COLLEGE OF PHARMACY.

PRELIMINARY EDUCATION.

The greatly increased knowledge of the sciences associated with the modern practice of pharmacy, and the vast number of new remedies introduced in recent years, have necessarily been accompanied by improved methods of teaching, extension of collegiate courses, and a marked elevation of the standard of pharmacy. The Philadelphia College of Pharmacy has, from time to time, advanced the preliminary educational requirements for matriculation, and in order to pursue the course of studies proposed in the curriculum, the student must be at least 18 years of age and possess a fair preliminary education. The minimum standard for admission to the course leading up to a degree of the College, is now the equivalent of the completed first year's instruction in an approved high school or academy of equal standing.

ADMISSION BY CERTIFICATE.

To be admitted without examination, the applicant must present to the Dean one of the following evidences of possessing the required education:

(1) The diploma of a literary or scientific department of a university or college, or a high school having a course of not less than three years, or an academy having an approved high-school standing.

(2) A teacher's permanent certificate issued by a State Department of Education.

(3) The certificate of a legally authorized State Examining Board covering the required subjects.

(4) A certificate showing one year's completed work in an approved high school, or its equivalent, officially signed and sealed by the principal or other authorized officer of the school.

The applicant can obtain from the Dean of this College a blank certificate showing the required subjects of preliminary education. He must have inserted therein by the principal, or other authorized officer of the school, the particulars indicated. Careful attention to these details will prevent delay, expense, and complications.

It is very desirable that all certificates be forwarded to the Dean on or before the 15th day of September. These will be submitted to the State Examiner, who will approve them so far as the studies pursued cover the requirements for matriculation, and his report, with the credit due, will be promptly sent by the Dean to the applicant.

ADMISSION BY EXAMINATION.

An applicant who cannot present a satisfactory diploma or certificate will be required to pass an entrance examination. Credit will be given to each student for preliminary studies as indicated by the State Examiner on the application certificate, but deficiencies must be made up in the examination.

The examination will be conducted by the State Department of Education and will cover the following required subjects and such of the elective subjects as each student may select. The value or credit given to each subject will be indicated by marks, and a minimum of not less than 16 counts (four of which must be obtained for algebra and four for languages) will be required of each student.

A detailed statement of the studies and of approved text-books for the guidance of students in preparatory work is herewith presented. It is urged upon those who have not the necessary certificate of scholastic attendance, that they carefully select their electives and prepare for the examination by personal study or private tutoring prior to matriculation, and to facilitate this, the names of the text-books recommended for review are attached.

PREFERRED SUBJECTS.

Language (8 counts).

ENGLISH GRAMMAR AND COMPOSITION (4 counts).

English Grammar (2 counts) will include parts of speech and their properties; declension; comparison; conjugation; general rules of syntax; analysis of sentences; meaning of words.

English Composition (2 counts).—Special attention must be paid to spelling, punctuation, capitalization, division and paragraphing.

Text-Books: Reed and Kellogg's "Higher Lessons in English;" McLean, Blaisdell and Morrow's "Steps in English" (Book II).

Latin (4 counts).

1. Grammar, including accentuation; rules for gender; declension of regular nouns, adjectives and pronouns; comparison of adjectives and adverbs; conjugation of regular verbs.

2. Vocabulary, exercises, and translations of easy sentences and selections.

Text-Books: Bennett's "Foundations of Latin;" Collar and Daniel's "First Year Latin."

Note.—In lieu of Latin, the student may elect an equivalent in one year's course in German, French or Spanish. Text-books in these: Miller's "Practical German Grammar;" Fraser and Spiers's "French Grammar;" De Torno's "Combined Spanish Method."

Mathematics (8 counts).

Arithmetic (4 counts).—The fundamental operations; fractions; decimals; interest; proportion; square and cube root; elementary mensuration—dimensions, surfaces, solids.

Text-Books: Brooks's "Normal Standard Arithmetic;" Gideon's "Model Complete Arithmetic."

Algebra (4 counts).—Including the fundamental operations, factoring, fractions, equations to quadratics.

Text-Books: Wentworth's "Short Course in Algebra;" Brooks's "Elements of Algebra."

History (6 counts).

History of the United States (4 counts).—The most important discoveries and settlements; the struggles of European nations for mastery in America; the Revolution; the leading events under the successive administrations; the War of 1812; the Mexican

War; the Civil War—the causes, most important campaigns, result; general development of our nation in extent, population, industries and power.

Constitution of the United States and Civics (2 counts).—The important features of the Constitution and Amendments; the general principles of our government; the legislative department, the executive, the judicial, with their general duties and powers; State government, the relation of State to National government, powers, officers, duties, divisions, etc.; Local government as shown by the village, town, city and county; duties of citizenship; taxes; fundamental laws.

Text-Books: McMaster's "School History of the United States" or Eggleston's "School History of the United States and its People."

Science (*4 counts*).

Physical and Commercial Geography.—The principal land and water divisions; the chief political divisions and their capitals and chief cities and important industries; belts or zones of climate with their characteristic plant and animal life; the most important articles of the world's commerce, and the most important commercial cities in the different countries; the most useful mineral resources; surface drainage; the general principles of physical geography.

Text-Books: Deane and Davis's "Inductive Advanced Geography;" Redway's "Natural Advanced Geography;" Houston's or Redway's "Physical Geography."

ELECTIVES.

In addition to the preceding subjects the applicant may select from the following any additional branches, each representing one year's high school course, from which he may make up the requisite number of counts, but the electives cannot displace algebra and languages, for each of which at least four counts must be obtained either by certificate or examination:—

Rhetoric (2 counts)—Text-Books: Hill's "Rhetoric;" Gardiner, Kittredge and Arnold's "Elements of Composition and Rhetoric."

English Literature and History of Literature (4 counts).—Text-Books: Tappan's "English Literature," or "Scudder's English Literature."

Greek (4 counts).—First year high-school course.

Plane Geometry (4 counts).—Three books: Wentworth's "Plane Geometry," or Brooks's "Plane Geometry."

Solid Geometry (2 counts).

Trigonometry (2) counts).

Business Arithmetic and Book Keeping (2 counts).

Physics (4 counts).—Text-Books: Gage's "Elements of Physics;" Carhart and Chute's "High School Physics" (omitting Electrostatics).

Elementary Chemistry (4 counts).—Text-Books: Shepard's "Elements of Chemistry," or Remsen's "Elementary Course in Chemistry."

Elementary Botany (2 counts).—Text-Books: Bailey's "Elementary Text Book of Botany;" Bergen's "Elements of Botany."

Physiology and Hygiene (2 counts).—Text-Books: Mills's Lessons in Physiology and Hygiene," or Dunglison's "Elementary Physiology."

English History (2 counts).—Text-Books: Montgomery's "History of England," or Tappan's "England's Story."

Greek History (2 counts).—Text-Books: Barnes's "General History," or Meyer's "General History."

Roman History (2 counts).—Text-Books: Barnes's "General History," or Meyer's "General History."

Other text-books than those mentioned may be used, provided they cover the subjects to the extent indicated.

The examination of applicants has been placed in the hands of Dr. Edgar A. Singer, Associate Superintendent of Public Schools, 696 City Hall, Philadelphia, who will pass upon the credentials and conduct the entrance examinations.

An applicant whose entrance examination or whose credentials do not fully meet the requirements (16 counts) assigned to subjects named in the preceding lists, may be admitted on an aggregate of 12 counts, *provided* he make up the remaining 4 counts before being advanced to the next higher class.

An entrance examination is held annually in Philadelphia, about the middle of September. The exact date may be obtained from the Registrar of the College, 145 N. Tenth Street.

JOSEPH P. REMINGTON, *Dean.*

BOOK REVIEWS.

A TEXT-BOOK OF PHYSIOLOGICAL CHEMISTRY for students of medicine. By John H. Long, Professor of Chemistry in Northwestern University Medical School. Illustrated. Philadelphia: P. Blakiston's Son & Co. $2.50.

For over thirty years Dr. Long has been a constant contributor to sanitary science. His papers on the chemistry of urine, feces and water have been numerous and extremely valuable. It was hardly likely that one who is so versed in, and whose contributions form such an important part of, the literature of physiological chemistry would write a book on this subject without it being of more than ordinary interest.

As a matter of fact the work has a number of meritorious features. In the first place it is written for medical students only. While it may be used profitably by other classes in which chemistry is taught it is primarily intended for students in medicine. In the second place it is written for medical students who have completed courses in the elements of general inorganic and organic chemistry. It therefore comes to us not as a book which contains much of what has been written over and over again in the hundreds of books on chemistry, but as a work with a message of its own which the author is well able to give.

Dr. Long's book is divided into five parts: (1) An introduction, including scope and methods. (2) Four chapters devoted to the consideration of the nutritives. (3) Five chapters in which the ferments and digestive processes are taken up. (4) The chemistry of the blood, tissues and secretions of the body are considered in eight chapters. (5) In three final chapters the author discusses the end products of metabolism. There is a good outline of the chemical phases of the recent theories of immunity; and a short explanation of the important application of the methods of cryoscopy, electrical conductivity and other physical processes, in the field of chemistry related to medicine. A considerable number of illustrative experiments are given in the text. There are thirty-two illustrations and an excellent index.

THE ELEMENTS OF PHYSICAL CHEMISTRY. By Prof. J. Livingston R. Morgan, Columbia University. 12mo, xii + 510 pages. Cloth,

$3.00. New York: John Wiley & Sons. London: Chapman & Hall, Limited. 1905.

That Morgan's "Physical Chemistry" is appreciated is shown by the appearance of the third edition. It is very clear in the presentation of the principles of physical chemistry, and in showing the relation of these to the other branches of chemistry. The author has succeeded in making physical chemistry "a tool by the aid of which *actual results* may be obtained." For instance, in the chapter on solutions, he (p. 123) shows how Young, by the application of the principles underlying this subject, has been able to devise a simple method for preparing absolute alcohol from a 95·57 per cent. alcohol. Instead of employing a dehydrating agent and distilling the alcohol alone, as is usually done, one can add to the alcohol containing the water, benzene *n* — hexane, and by fractional distillation the dehydrated alcohol is obtained and the benzene recovered.

In this edition the subject matter has been brought up to date and has been made as intelligible as possible, even to the non-mathematical reader. It is without doubt the best book on this subject which has thus far appeared in the English language.

ELECTRO-CHEMISTRY OF ORGANIC COMPOUNDS. By Walther Löb. Authorized translation from the author's enlarged and revised third edition by H. W. F. Lorenz. 8vo, x + 308 pages; 10 figures. Cloth, $3.00. New York: John Wiley & Sons. London: Chapman & Hall, Limited.

The great progress which the electro-chemistry of organic compounds has made in the past few years and the large increase in the quantity of new experimental material have required a new edition of Dr. Löb's book on this important subject. The subject matter has been entirely re-written and re-arranged. Part I is devoted to electrolytic processes: (*a*) Theoretics; (*b*) Methodics; (*c*) Electrolysis of Aliphatic Compounds; (*d*) Electrolysis of Aromatic Compounds; (*e*) Electrolysis with Alternating Currents; (*f*) Electric Endosmose. In Part II electrothermic processes and the silent electric dicsharge are considered: (*a*) Theoretics and Methodics; (*b*) The Spark Discharge and the Voltaic Arc; (*c*) The Utilization of Current Heat in Solid Conductors; (*d*) The Silent Electric Discharge and the Effect of Tesla-currents.

The book is not intended to take the place of the various excellent books on electro-chemical experiments, as those by Oettel (translated by E. F. Smith) and Elbs; but is devoted to a philosophical discussion of the general principles involved in such experiments, and is intended to give a correct interpretation of the various methods used in the electrolysis of the organic compounds. The original literature is cited and there are two comprehensive indexes, one of authors and the other of substances. The subject is extremely interesting, the book is well written, and is an important contribution to the literature of electro-chemistry.

A SYSTEMATIC COURSE OF QUALITATIVE CHEMICAL ANALYSIS OF INORGANIC AND ORGANIC SUBSTANCES, with explanatory notes by Henry W. Schimpf. 8vo, vii + 156 pages. Cloth, $1.25, net. New York: John Wiley & Sons. London: Chapman & Hall, Limited.

The book has been prepared for students in pharmacy and contains most of the inorganic as well as organic reactions that a student of pharmacy would need in his work.

Part I is devoted to Definitions and General Considerations: Notation, Classification, and Nomenclature of Elements and Organic Compounds.

In Part II is considered the Identification and Separation of Inorganic Bases and Acids: The Systematic Analysis of a Chemical Substance, Simple or Compound; Heat Test, Sulfuric-acid Test, the Charcoal Test, Sodium-carbonate Test, the Hydrochloric-acid Test, Table for the Identification of the Metals, Chart for the Separation of the Metals (Group I to V), Chart for the Separation of Insoluble Phosphates, Preparation of a Solution for Analysis in the Wet Way, Alloys and Hard Metals, Table Showing the Solubility of the More Commonly Occurring Salts, the Identification of Acids and Acidulous Radicals, Systematic Detection of the Acids in Solutions, Special Tests for Acids of Groups I to IV, Special Tests for Organic Acids.

Part III is devoted to Qualitative Analysis of Organic Substances: Behavior of Organic Substances with Immiscible Solvents; Behavior of Organic Substances with Fehling's Solution; A Systematic Scheme for the Identification of the Most Important Carbohydrates; Chart for the Detection of the More Common Organic Compounds of Pharmaceutical Interest. Class A. Division *a*. Liquids Miscible with Water; Methods for the Detection of Methyl Alcohol in Grain

Alcohol, Pharmaceutical Preparations, Beverages, etc. Class A. Division *b*. Liquids not Miscible with Water. Class B. Scheme for the Identification of Acetanilide, Phenacetin, Quinine Sulfate; Prof. E. H. Bartley's Scheme for the Identification of Organic Substances Commonly Used in Pharmacy, Medicine, and the Arts; Inspection; Separation of Organic Compounds into Groups; Ultimate Qualitative Analysis of Organic Compounds; Summary of Non-nitrogenous Classes of Organic Bodies; Identification of Scaled Iron Compounds; A Scheme for the Detection of Poisons; A Scheme of Urinalysis; Preparation of Reagents.

Taken in conjunction with a course of lectures on analytical chemistry this work is quite replete and covers the ground for which it is intended very well.

WHYS IN PHARMACY.—A compilation of reasons underlying the principles of pharmacy, supplemented by a table of equations. By Edsel A. Ruddiman. 12mo, vi+196 pages. Cloth, $1.00. New York: John Wiley & Sons; London: Chapman & Hall, Ltd.

In the preface of Dr. Ruddiman's book the reasons for its publication are given as follows:

"In the publication of these questions and answers the writer claims no originality. The only reason he has for putting them into book form is because he has had numerous requests for them from his students and the readers of the *Bulletin of Pharmacy* in which much of the matter has been printed.

"Early in the course of the author's teaching he came to the conclusion that the teaching of the reasons for the use of certain ingredients and for mixing these in certain orders is one of the most important parts of the work—more essential than the memorizing of formulas. The book is not intended as a quiz compend, but as an aid to those who wish to get at the principles underlying the subject. At first only the questions were written, leaving the student to look up the answers for himself. Mr. Joseph Helfman, editor of the *Bulletin of Pharmacy*, suggested that more good would be done the readers by giving the answers as well, and the writer came to the same conclusion."

The following subjects are considered: (1) Preparations: Waters, cerates, papers, collodions, decoctions, elixirs, plasters, emulsions, percolation and fluid extracts, solid extracts, glycerites, infusions,

liniments, solutions, masses, mixtures, mucilages, oleates, oleoresins, oils, pills, powders, resins, spirits, suppositories, syrups, tinctures, troches, ointments and wines. (2) Chemicals: Acids, inorganic compounds, aluminum salts, ammonium salts, antimony salts, silver salts, gold salts, bismuth salts, calcium salts, chromium salts, iron salts, mercury salts, magnesium salts, lead salts, potassium salts, sodium salts, sulphur and zinc salts. (3) Organic drugs; (4) Alkaloids; Drug assays; (5) Prescriptions; (6) Miscellaneous; (7) Equations.

The book contains a large amount of information valuable to the student. The only question which arises in looking over books of this kind is whether the student might not "dig it out" for himself and whether he does not actually get this information in the quizzes supplementing the courses of lectures in colleges of pharmacy.

SELECT METHODS IN FOOD ANALYSIS. By Henry Leffmann and William Beam. Second edition, revised and enlarged. With one plate and fifty-four other illustrations. $2.50 net. Philadelphia: P. Blakiston's Son & Co., 1012 Walnut Street.

A work on food analysis to maintain its authority must be frequently edited. The second edition of this valuable work of Drs. Leffmann and Beam will be welcome to all food analysts. The present edition contains numerous alterations and much new matter has been inserted. Among the additions are: Detailed descriptions of special arrangements for polarimetry, distillation and extraction; new processes for detection of natural colors used as substitutes for fruit and egg colors; improvements in detection of formaldehyde, abrastol and saccharin; rapid methods for examination of vanilla and lemon extracts, and for the determination of fat in condensed milk and cereal foods; determination of boric acid in fruit juices; analytic data in regard to fruit juices, jams and jellies; detection of palm oil in oleomargarin, and many minor modifications of tests and processes intended to simplify or expedite analysis.

As rewritten this work of Leffmann and Beam is thoroughly up-to-date, full of analytical data and methods, and is one of the most useful books on food analysis that has been prepared.

CASPARI'S PHARMACY. A Text-Book on Pharmacy. For Students and Pharmacists. By Charles Csapari, Jr., Maryland College of Pharmacy, Baltimore. New (third) edition. Octavo, 830 pages,

with 301 illustrations. Cloth, $4.25, net. Philadelphia and New York: Lea Brothers & Co. 1906.

Caspari's Pharmacy has been written with the view of affording to students and pharmacists a kind of commentary on the Pharmacopœia. The subjects considered are grouped under three distinct headings. Part I comprises general pharmacy, which includes the study of weights and measures, specific gravity, the application and control of heat, mechanical subdivision of drugs and methods of solution and separation, together with a classification and description of the various plant products and solvents used in pharmacy. Part II treats of practical pharmacy, or the study of official galenical preparations and the consideration of operations of the dispensing counter. This is one of the most original and valuable portions of the book. Part III is devoted to the study of pharmaceutical chemistry or the chemistry of the inorganic and organic substances of the Pharmacopœia. There is also a chapter on the animal products used in pharmacy.

This work by Caspari contains a large amount of information which is of great value to both students and pharmacists. The chemistry of the book is particularly strong. Some statements in the book might be questioned in the light of recent researches, as under the assay of ipecac, where it is stated "It is possible to separate the cephaeline from the emetine . . . but for purposes of valuation of the drug this more tedious method is quite unnecessary." The researches of Paul and Cownley (see this JOURNAL, Vol. 73, p. 116) would seem to show that this is as necessary as the separation of strychnine in the assay of nux vomica as now directed by the Pharmacopœia. There are a number of typographical errors, as the misspelling of the Latin botanical name of the plants yielding strophanthin (p. 789). The words "natural order" occur where the term "family" should be used in a number of cases (pp. 734, 737, etc.).

MATERIA MEDICA, PHARMACY AND THERAPEUTICS. Revised in accordance with the new U.S.P., including the physiological action of drugs, special therapeutics of disease, official and practical pharmacy, minute directions for prescription writing, incompatibility, etc. By Samuel O. L. Potter. Tenth edition. Octavo. Cloth, $5.00; leather or half morocco, $6.00 net. Philadelphia: P. Blakiston's Son & Co., 1012 Walnut Street.

Potter's Materia Medica is one of the most widely used books on this subject in the United States. In the present edition one hundred and thirteen new articles and paragraphs appear, and four hundred articles have been rewritten. There is a thumb index indicating each main division of the book, which will greatly facilitate its use.

A Text-Book on Modern Materia Medica and Therapeutics. By A. A. Stevens, of the University of Pennsylvania and the Woman's Medical College of Philadelphia. Fouth edition, revised. Octavo of 670 pages. Cloth, $3.50 net. Philadelphia and London: W. B. Saunders & Co. 1905.

This new edition of Stevens's work on materia medica and therapeutics has been revised and adapted to the Eighth Decennial Revision of the United States Pharmacopœia. New articles dealing with scopolamin, ethyl chloride, theocin, veronal and radium have been introduced, and in the section on radiotherapy much new matter has been incorporated.

A Short Manual of Analytical Chemistry, qualitative and quantitative—inorganic and organic. By John Muter. Fourth American edition. Illustrated. The chapters relating to the analysis of drugs being based upon the Eighth Revision (1905) of the United States Pharmacopœia. Philadelphia: P. Blakiston's Son & Co.

Muter's manual has long been recognized as a concise and valuable work on the qualitative and quantitative analysis of inorganic and organic substances. The present edition has been made to conform to American requirements and has been edited for the use of analysts in this country. Part I, on qualitative analysis, is devoted to the consideration of: (*a*) the processes employed by practical chemists; (*b*) detection of the metals; (*c*) detection and separation of acid radicals; (*d*) qualitative analysis, as applied to the detection of unknown salts; (*e*) qualitative detection of alkaloids and certain organic bodies used in medicine, with a general sketch of toxicological procedure. In Part II, on quantitative analysis, are considered: (*a*) weighing, measuring and specific gravity; (*b*) volumetric quantitative analysis; (*c*) gravimetric quantitative analysis of metals and acids; (*d*) ultimate organic analysis; (*e*) special processes for the analysis of water, air and food; (*f*) analysis of gases, polarization and spectrum analysis, etc.

A TEXT-BOOK OF CHEMISTRY for the use of students and practitioners of medicine, dentistry and pharmacy. By William R. Jones, University College of Medicine, Richmond, Va. Illustrated. Philadelphia: P. Blakiston's Son & Co.

This work is a general chemistry adapted to the use of students in medicine, dentistry and pharmacy. The following subjects are considered: Physics, chemical philosophy, inorganic chemistry, organic chemistry, methods of quantitative analysis, physiological chemistry. The book is well written and will be found useful in the courses for which it is proposed.

TEXT-BOOK OF MEDICAL AND PHARMACEUTICAL CHEMISTRY. By Elias H. Bartley, Long Island College Hospital. Sixth edition, thoroughly revised, with ninety illustrations. Philadelphia: P. Blakiston's Son & Co.

Bartley's chemistry is intended for students in medicine and pharmacy and is becoming more valuable with each new edition. It contains a large amount of information regarding the composition of many common substances. The subject matter is presented in quite an instructive and more or less original manner.

NEUE ARZNEIMITTEL ORGANISCHER NATUR. Vom pharmazeutisch-chemischen Standpunkte aus bearbeitet. Von L. Rosenthaler. Berlin: Verlag von Julius Springer. 1906. M. 6.

This work is written particularly for the use of pharmacists. The more important new remedies are considered, and they are divided into the following classes: (*a*) anesthetics and hypnotics; (*b*) antiseptics; (*c*) antipyretics; (*d*) purgatives; (*e*) diuretics, etc. Under each synthetic is given the composition, preparation or mode of manufacture; properties, tests, uses and other special features.

It is a first-rate little book and to be recommended to pharmacists, chemists and others interested in the subjects which are considered.

PHILADELPHIA BRANCH OF THE AMERICAN PHARMACEUTICAL ASSOCIATION.

In pursuance of the following letter a preliminary meeting for inaugurating a local branch of the American Pharmaceutical Association was held in the Museum of the Philadelphia College of Pharmacy on Tuesday, March 20, 1906, at 2.30 P.M.:

PHILADELPHIA, PA., March 15, 1906.

To the Local Members of the American Pharmaceutical Association:

To more readily attain the objects sought by the founders of the American Pharmaceutical Association, and in accordance with a resolution adopted at the Fifty-first Annual Meeting, held at Mackinac Island, Michigan, in 1903, it has been suggested that a branch of this Association be inaugurated and maintained in the city of Philadelphia.

You are cordially invited to attend a preliminary meeting to be held in the Philadelphia College of Pharmacy on the afternoon of Tuesday, March 20, 1906, at 2.30 o'clock, and to sign the necessary petition to the Council of the American Pharmaceutical Association, and a call for a general invitation to all of the local members of the Association to be present at a subsequent meeting for formal organization.

JOSEPH P. REMINGTON,
WILLIAM MCINTYRE,
MARTIN I. WILBERT.

On motion of Professor Remington, Mr. J. H. Redsecker, of Lebanon, Pa., was requested to take the chair, and Mr. M. I. Wilbert, of Philadelphia, was requested to act as Secretary.

Professor Remington then briefly outlined the object of the meeting, and requested the Secretary to read the following proposed general invitation to a formal meeting, to be held on Wednesday, March 28, 1906, at the College of Physicians:

The undersigned members of the American Pharmaceutical Association, having petitioned the Council of that Association for the privilege of forming, in the city of Philadelphia, a local branch to be known as the Philadelphia Branch of the American Pharmaceutical Association, hereby extend to you an invitation to be present at a meeting for formal organization, to be held on the evening of Wednesday, March 28, 1906, in the lower lecture hall of the College of Physicians, N. E. cor. Thirteenth and Locust Streets, at 8 P.M.

Among the more direct objects to be sought for and attained by the institution of such a local branch, we may suggest:

The development of a scientific spirit among the members of the local profession.

A more complete adherence to the Pharmacopœia of the United States, and other generally accepted and well-known formularies, in making the preparations to be used in the practice of medicine.

The discovery and exposure of frauds and of fraudulent or dishonest practices in connection with the materials used as medicine.

The elimination of secrecy and fraud from the practice of pharmacy and the cultivation of a proper appreciation, by members of the medical profession and others, of the ability, duty and position of an up-to-date pharmacist.

All members of the American Pharmaceutical Association, and all reputable pharmacists who are in accord with the principles of that association, are invited to attend this initial meeting and to become active members of the local branch.

This general invitation was, on motion, adopted.

Professor Remington then read the proposed petition to the Council of the American Pharmaceutical Association.

On motion of Mr. Cliffe, Prof. Joseph P. Remington, Mr. William McIntyre and Mr. M. I. Wilbert were appointed a committee to draw up, and to present at the next meeting, a set of rules or by-laws for the guidance of the local branch.

There being no further business the meeting was declared adjourned until Wednesday, March 28th, and the members present invited to sign the following petition to the Council:

To the Council of The American Pharmaceutical Association:

We the undersigned members of the American Pharmaceutical Association, respectfully ask that you extend to us the privilege of forming a local branch of the American Pharmaceutical Association, in the City of Philadelphia, to be known as the Philadelphia Branch of the American Pharmaceutical Association.

Our aim in inaugurating this local branch is to extend and to popularize the objects and the established precedents of the American Pharmaceutical Association, and to secure for pharmacy, and for her votaries and followers, the recognition that is rightfully due them for their contributions to the progress and welfare of the human race.

SIGNED.

J. H. Redsecker.	Joseph P. Remington.	F. P. Stroup.
A. M. Hance.	George W. Davis.	E. H. Hance.
Wm. R. Warner, Jr.	Richard M. Shoemaker.	William McIntyre.
Charles A. Weidemann.	George B. Weidemann.	J. T. Harbold.
W. L. Cliffe.	Clement B. Lowe.	Aquila Hoch.
Edwin M. Boring.	J. C. Peacock.	Franklin M. Apple.
Joseph L. Lemberger.	Charles T. George.	Joseph W. England.
George M. Beringer.	Chas. H. LaWall.	Chas. E. Vanderkleed.
Samuel P. Sadtler.	M. I. Wilbert.	Henry Kraemer.

PHARMACEUTICAL MEETING.

The stated Pharmaceutical Meeting of the Philadelphia College of Pharmacy was held on Tuesday afternoon, March 20th, with J. H. Redsecker, Ph.M., of Lebanon, Pa., in the chair.

The meeting was devoted to a symposium on the subject of the use of antiseptics in foods. The interest attaching to this subject at present and the prominence of the speakers on the programme combined to attract a number of representative pharmacists and others as well. Following are the names of some of those in attendance: Thomas S. Wiegand, James T. Shinn, Joseph L. Lemberger, Charles T. George, Louis Emanuel, E. M. Boring, Geo. M. Beringer, W. L. Cliffe, E. Fullerton Cook, Joseph W. England, E. H. Hance, A. M. Hance, Ambrose Hansberger, C. M. Kline, Clement B. Lowe, Charles H. LaWall, Wm. McIntyre, Henry Kraemer, Franklin M. Apple, Aquila Hoch, J. T. Harbold, Geo. W. Davis, Mr. and Mrs. J. C. Peacock, Warren H. Poley, Joseph P. Remington, Richard M. Shoemaker, Samuel P. Sadtler, F. P. Stroup, Chas. A. Weidemann, Wm. R. Warner, Jr., M. I. Wilbert, Chas. E. Vanderkleed, C. P. Gabell, Prof. Susannah G. Haydock and Dr. Mary Pennington.

Dr. H. W. Wiley, Chief of the Bureau of Chemistry, U. S. Department of Agriculture, was the first speaker introduced, and gave an address on "The Use of Preservatives in Foods." (See page 153.)

Dr. H. C. Wood, Jr., of Philadelphia, followed with a paper entitled, "Is the Use of Food Preservatives Justifiable?" This paper will probably be published in full in a subsequent issue of this JOURNAL. Dr. Wood said that knowing the conditions which have to do with the commerce in foods, he desired to be fair to manufacturers, but that he was pretty thoroughly convinced that the use of chemical preservatives is not justifiable. He was opposed to their use even when the name and quantity of the chemical used are given on the label or otherwise stated, for the reason that the majority of consumers are not able to judge as to the harmlessness or harmfulness of preservatives. He said that the subject is one of special interest to physicians and pharmacists, and he urged those in attendance to use their influence in securing the passage of the Pure Food Bill now before the House of Representatives.

Joseph L. Lemberger, president-elect of the American Pharmaceutical Association, said that for some time he had had a conviction

that the use of food preservatives was not desirable, and that his position had been criticised both favorably and unfavorably, the advocates of preservatives claiming that their use is to be recommended under certain circumstances, as, for instance, in delay in transportation. Mr. Lemberger said that in view of the arguments advanced by Dr. Wiley and Dr. Wood, he felt that it would be wrong to encourage the use of preservatives. He said that he personally was opposed to the use of foods containing them and that what he did not favor for himself he did not consider good for his neighbor. Referring to the Pure Food Bill, he hoped that it would pass both houses of Congress, and said that then provision should be made for the proper inspection of food products, so as to insure their purity.

Warren H. Poley desired to know if preservatives have the same effect after being applied to food as when administered directly, or, in other words, if the preservative combines with the food material in such a manner as to be less harmful than it otherwise would be. Dr. Wiley in reply said that in the experiments which he had been making the chemicals had been directly administered, that his object had been to study the effects on the organism and not on the foods. He said that borax undergoes no change when applied to foods, and stated that in those cases where there is a combination of the chemical and food product the effect of the chemical on the organism would ultimately be realized.

Prof. Joseph P. Remington said that he was in favor of improving the quality of foods, but that he was not quite convinced that a small amount of preservative is objectionable. In this connection he referred to an experience of Dr. Squibb during the Civil War. Dr. Squibb had undertaken to supply the army with chloroform and ether, but in transporting these liquids over the mountains in Virginia and the neighboring States, they were decomposed, the chlorine being liberated from the chloroform, and it was found necessary to add a small quantity of alcohol to prevent decomposition. On the other hand, Professor Remington said that he was thoroughly assured that if food preservatives are used, the fact should be stated on the label, and that this also applies to all medicines and proprietary preparations.

FLORENCE YAPLE,
Secretary pro tem.